SD 11
.A1
A42
no. 216

ASH

. . . an American wood

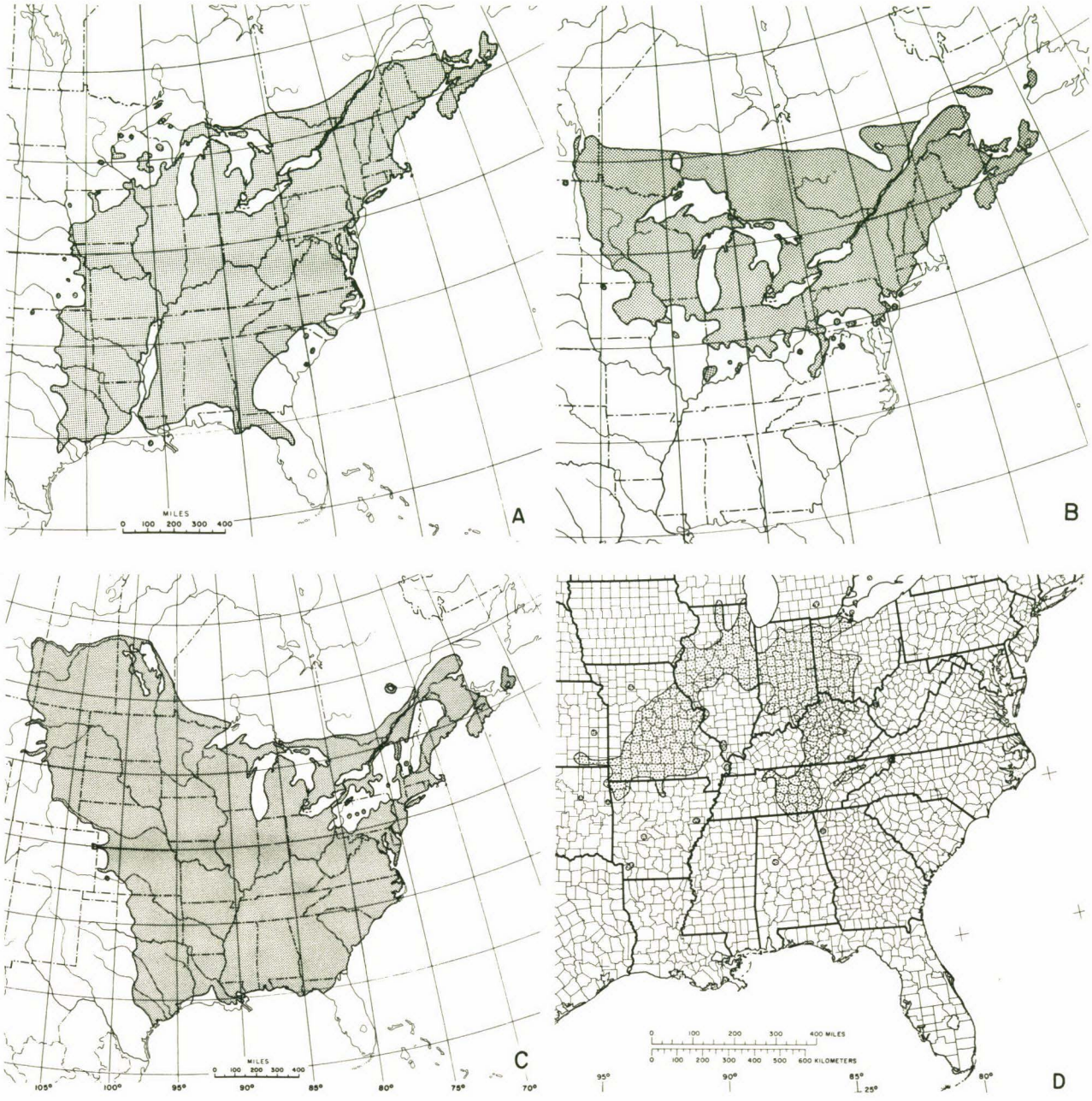
The ashes are widely distributed throughout continental United States and into Canada and Mexico. Of the six commercially important species—white, pumpkin, blue, black, green and Oregon ash—five are found in the eastern portion of the United States and one is found west of the Rocky Mountains. The ashes, especially white ash, are known for toughness and high strength and are preferred for athletic equipment. Both upholstered and unupholstered furniture are also major uses. Ash is only a small part of the total annual hardwood consumption.

FS-216
March 1973
U.S. Department of Agriculture

Forest Service

OCT 1 1973

269204



F-521596, 506593, 506594, 521571

Figure 1.—Natural range of white ash (A), black ash (B), green ash (C), blue ash (D).

COVER: F-269204

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price 25 cents
Stock Number 0101-00321

ASH

. . . *an American wood*

Harold A. Stewart and John E. Krajicek[1]

DISTRIBUTION

The trees and shrubs properly called ash (*Fraxinus* sp. Linneaus) consist of about 65 species primarily in the north temperate zone, but extending south to Mexico, Cuba, northern Africa, southern Asia, and Java. Sixteen species occur in the United States. Of these, six—white, pumpkin, blue, black, green, and Oregon ash—are commercially important for lumber and other wood products.

The distribution of five of the species is confined to the eastern portion of the United States (three of them extending northward into Canada); but Oregon ash occurs naturally only in Washington, Oregon, and California. The natural ranges of all except pumpkin ash are shown in figures 1 and 2.

DESCRIPTION AND GROWTH

The scientific and common names, growth characteristics, and leaf and seed characteristics are shown in table 1 (p. 6).

All of the ash species have opposite pinnately compound leaves. The seeds are borne in samaras, which are clustered (fig. 3). The major differences helpful in identifying a species are number of leaflets, whether the margins of the leaflets are smooth or toothed, and the extent to which the wing surrounds the seed.

Ash bark is usually gray and on young stems it sometimes has an orange tinge. On mature trees it is finely furrowed into diamond shaped areas separated by narrow interlacing ridges (fig. 4).

Like most trees, ash does best on fertile, moist, well-drained soils. A possible exception is pumpkin ash, which almost always is found on sites where very wet conditions are common. White ash and perhaps Oregon ash occur most on moist, well-drained soils. The others—green ash, blue ash, and black ash—are less demanding on site conditions, in terms of survival, though growth rates are optimum on the well-drained sites. Green ash, with the largest range, is probably the most adaptable of all of the ashes, occurring naturally on wet sites subject to frequent flooding as well as on sites where the amount of available moisture is restricted.

Published data on the growth rate of ash are quite limited. Green ash planted in the shelterbelts in the Great Plains averaged 1.3 feet of height growth per year, and open-grown trees in Philadelphia grew at an average rate of from slightly more than 2 feet to nearly 3 feet per year during the first 21 years. In central Massachusetts, white ash in unthinned even-aged stands reached a height of 38 feet in 20 years and 76 feet in 50 years.

COMMON NAMES

Common names of all the commercial ashes are given in table 1. Local usage of common names may vary somewhat from that given in the table.

RELATED COMMERCIAL SPECIES

All six species of ash are sold as ash lumber, which includes both commercial white and brown ash. Only American white ash (*Fraxinus americana*) has the superior strength properties that qualify it

---

[1] Respectively, forest products technologist and research forester, U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station, Forestry Sciences Laboratory, Carbondale, Ill., in cooperation with Southern Illinois University.

NOTE: This publication supersedes unnumbered publication *Ash*, issued 1945.

F-521572

Figure 2.—Natural range of Oregon ash.

for the commercial term "white ash". Only black ash (*Fraxinus nigra*) is classified as brown ash commercially. However, green, Oregon, or blue ash are included as white ash, although both green and Oregon ash have intermediate properties between white ash and black and pumpkin ash. In the trade, pumpkin ash refers to wood which is lightweight and fails brashly. Pumpkin ash is cut from large trees grown in wet river bottoms.

Because of the wide range of the ash species and since ash is only occasionally found in pure stands, the number of associated commercial species is large. Major associated species for the commercial ash species are:

1. *White ash:* Eastern white pine, northern red oak, white oak, sugar maple, red maple, yellow birch, American beech, black cherry, American basswood, eastern hemlock, American elm, and yellow-poplar.

2. *Oregon ash:* Red alder, black cottonwood, willow, bigleaf maple, and Oregon white oak.

3. *Green ash:* Red maple, pecan, sugarberry, hackberry, sweetgum, American sycamore, eastern cottonwood, quaking aspen, plains cottonwood, black willow, willow oak, and American elm.

4. *Black ash:* American elm, red maple, northern white-cedar, balsam fir, black spruce, hemlock, yellow birch, paper birch, white spruce, and tamarack.

5. *Pumpkin ash:* Baldcypress and water tupelo.

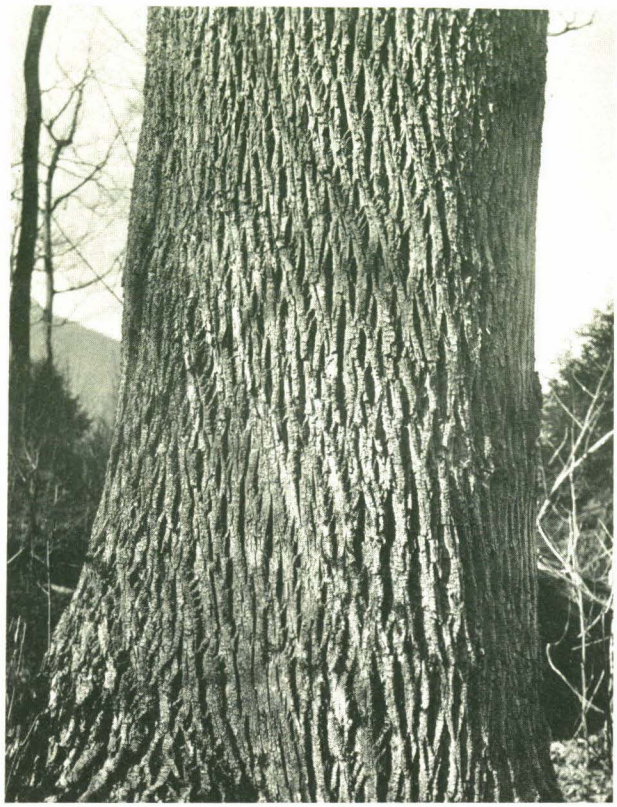
6. *Blue ash:* Northern red oak, mockernut hickory, sweetgum, white oak, white ash, slippery elm, American elm, and sugar maple.

F-491045, F-491047

Figure 3.—Typical leaves (A) and seeds (B) of members of ash family.

SUPPLY

The total sawtimber growing-stock stand of all the species sold as ash is roughly estimated at 9



F-5117

Figure 4.—Bark of white ash.

billion board feet. About 80 percent of the sawtimber is east of the Rocky Mountains.

PRODUCTION

The production of ash lumber was highest at the beginning of the 20th century and decreased rapidly until 1940, when the decrease slowed to a minimum production about 1950 (fig. 5). Since 1950, ash lumber production has increased slowly and steadily with some variation. Good white ash required for handle stock and athletic equipment is becoming difficult to obtain. The emphasis on recreation may create a greater demand for white ash of suitable quality. The supply of other ash species, however, appears to be adequate for future demands.

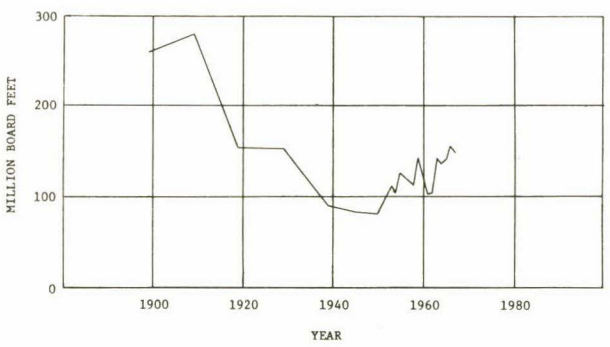


Figure 5.—Production of ash lumber.

CHARACTERISTICS AND PROPERTIES

The heartwood of ash varies from brown to grayish brown and contrasts sharply with the light-colored sapwood. The width of the sapwood ranges from 3 to 6 inches. The growth rings are distinct because of the 2-to-4- pores-wide springwood which abruptly changes to summerwood. The summerwood pores are barely visible to the naked eye. The parenchyma of the white ash forms a sheath around the summerwood pores and often appears to unite the pores in the outer margin of the summerwood. The wood does not have a characteristic odor or taste.

White ash wood is generally straight-grained and shrinks moderately, but it holds its shape well and can be kiln-dried rapidly and satisfactorily. The wood is also heavy (specific gravity 0.55 green), hard, strong, stiff, high in shock resistance, and wears smooth with use. The wood machines well, is better than average in nail- and screw-holding strength, and is intermediate for gluing.

Oregon ash is the nearest to white ash in strength properties and performance. Black ash and the other species of ash generally have a darker heartwood. Their average specific gravity, based on green volume and ovendry weight, ranges from 0.45 to 0.50. They have lower strength properties but are moderately strong, hard, and stiff as compared with all native hardwoods. These ash species split easier, shrink more, are average in workability, and perform somewhat less favorably than white ash in service, especially when they are exposed to extreme cycles of moisture content from wet to dry.

PRINCIPAL USES

The properties of straight grain, stiffness, strength, hardness, good bending properties, high shock resistance, and capacity to wear smooth in use, are ideal for handle stock. Previously, ash was principally used for handles, especially for farming

Table 1.--Names, growth characteristics, and leaf and seed characteristics of the commercial ashes

Scientific Name	Common Names*	Growth Characteristics	Leaf Description**	Seed***
F. americana L.	White ash, Biltmore ash, Biltmore white ash, smallseed white ash.	Largest of the ashes; commonly 70 to 80 feet tall or taller; straight-boled; found on fertile, well-drained sites.	8 to 12 inches long, with 5 to 9, usually 7, stalked, oval or broadly lance-shaped leaflets 2-1/2 to 5 inches long, long- or short-pointed, slightly toothed, smooth or hairy beneath.	Fruit 1 to 2-1/2 inches long, 1/4 inch wide, lanceolate; wing terminal or slightly decurrent; in crowded clusters 6 to 8 inches long; persistent on twigs into winter.
F. latifolia Benth.	Oregon ash.	Medium-sized to large tree frequently 70 to 80 feet tall; usually found on rich moist soil near streams.	5 to 14 inches long, with 5 to 7 leaflets usually without stalks, elliptical, 2 to 5 inches long, short-pointed, edges smooth or slightly toothed, light green, nearly smooth above, finely hairy beneath.	Fruit 1 to 2 inches long, oblong to elliptic, 1/4 to 1/3 inch wide; wing extends to below middle of slightly compressed seed cavity.
F. nigra Marsh.	Black ash, basket ash, brown ash, hoop ash, swamp ash, water ash.	Medium-sized tree, usually less than 60 to 70 feet tall; commonly grows in bogs or other poorly-drained areas, though occurs occasionally on well-drained sites.	12 to 16 inches long, with 7 to 11 stalkless, oblong or broadly lance-shaped leaflets 3 to 5 inches long, long-pointed, finely toothed, with tufted hairs beneath.	Fruit 1 to 1-1/2 inches long, 1/3 inch wide, oblong to slightly oblong-obovate; wing surrounds the indistinct seed cavity; clusters of fruit hang in open panicles 8 to 10 inches long.
F. pennsylvanica Marsh.	Green ash, Darlington ash, red ash, white ash, swamp ash, water ash.	Medium-sized tree, commonly 60 to 70 feet tall; usually occurs on bottomlands, but butt log is frequently brashy if site is excessively wet; widely planted in shelterbelts and on strip-mined areas.	10 to 12 inches long, with 7 or 9 stalked, oval or lance-shaped leaflets 2 to 6 inches long, long-pointed, slightly toothed, smooth or hairy beneath.	Fruit 1 to 2-1/2 inches long, 1/4 to 1/3 inch wide, lanceolate to slightly oblanceolate or oblong-obovate or elliptic; wing extending to middle or below middle of terete, slender seed cavity; fruits hang in open panicles.
F. profunda (Bush) Bush	Pumpkin ash, red ash.	Large tree up to 120 feet tall, often with a buttressed base; occurs on wet soils often inundated during several months of the year.	9 to 18 inches long, with 7 to 9 stalked, elliptical or lance shaped leaflets 4 to 10 inches long, long-pointed, with edges smooth or slightly toothed, soft hairs beneath.	Fruit 2 to 3 inches long and 3/8 to 1/2 inch wide; wing extends to below middle or nearly to base of thick terete many-rayed seed cavity; fruit in long, drooping many-fruited pubescent clusters.
F. quadrangulata Michx.	Blue ash.	Medium-sized to large tree, usually 60 to 70 feet tall; occurs on fertile uplands and well-drained bottomlands.	8 to 12 inches long, with 7 to 11 short-stalked, oval or lance-shaped leaflets 2-1/2 to 5 inches long, long-pointed, toothed. Twigs are 4-angled.	Fruit 1 to 2 inches long and 1/3 to 1/2 inch wide, oblong-ovate; wing surrounds the faintly many-rayed compressed seed cavity; wing often notched at the apex.

*First listed name is the preferred common name.
**All species listed have paired, pinnately-compound leaves.
***Fruit is a winged samara.

implements. As farming methods and equipment developed, the primary use of ash changed.

Presently, the principal use for ash is unupholstered furniture, followed by upholstered furniture. Other prominent uses include hardwood dimension and flooring, millwork, sporting and athletic goods, handtools, and wirebound boxes and crates. Because of the all-around desirable prop-

erties of ash, the demand for ash, especially white ash, should continue to increase at a modest rate in the future.

REFERENCES

Gill, Thomas G. and Phelps, Robert B.
1969. Wood used in manufacturing industries, 1965. U.S. Dep. Agr., Statist. Bull. 440, 121 p., illus.

Harlow, William M. and Harrar, Ellwood S.
1968. Textbook of dendrology, American Forestry Series, Ed. 5. 512 p., illus. New York: McGraw-Hill Book Co.

Little, Elbert L., Jr.
1953. Checklist of native and naturalized trees of the United States (including Alaska). U.S. Dep. Agr., Agr. Handb. 41, 472 p.

Panshin, A. J., Zeeuw, C. de, and Brown, H. P.
1964. Textbook of wood technology, Vol. I, Ed. 2. 643 p., illus. New York: McGraw-Hill Book Co.

Preston, Richard J.
1948. North American trees (exclusive of Mexico and tropical United States). Ia. State College Press, Ames, 371 p., illus.

Sargent, Charles Sprague.
1933. Manual of the trees of North America (exclusive of Mexico). Houghton Mifflin Co., Boston and New York, 910 p., illus.

USDA.
1949. Trees. 1949 yearbook of agriculture. U.S. Government Printing Office, Washington, D.C., 944 p., illus.

USDA Forest Products Laboratory.
1955. Wood handbook. U.S. Dep. Agr., Agr. Handb. 72, 528 p., illus.

———.
1956. Wood—colors and kinds. U.S. Dep. Agr., Agr. Handb. 101, 36 p., illus.

USDA Forest Service.
1958. Timber resources for America's future. USDA Forest Serv., Forest Res. Rep. 14, 762 p., illus.

———.
1965a. Silvics of forest trees of the United States. U.S. Dep. Agr., Agr. Handb. 271, 762 p., illus.

———.
1965b. Timber trends in the United States. USDA Forest Serv., Forest Res. Rep. 17, 235 p., illus.

U.S. GOVERNMENT PRINTING OFFICE : 1973 OL—495–101